sortableclasses Documentation

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Makes classes sortable by precedence and priority. The order of precedence of classes and their priority is defined per class and at runtime.

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CHAPTER 1

sortableclasses

Makes classes sortable by precedence and priority. The order of precedence of classes and their priority is defined per class and at runtime.

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1.1 Use case

sortableclasses makes classes sortable by precedence and priority. This is useful if you want to apply a set of transformations to some data (i.e., if you're writing what on UNIX-ish systems is called a 'filter'). You could chain function calls (i.e., `return transform1(transform2(transform3(...)))`), but the larger the number of transformation gets, the more difficult this becomes to maintain.

sortableclasses enables you to define each of those transformations as a class, assign to each of them a list of predecessors and successors classes and/or a numerical priority, and then simply sort them using `sorted()`.

Simply put, it enables you to write classes that behave similarly to plugins.

For example:

```
>>> import sortableclasses
>>> import abc
>>> import functools
>>>
>>> class Transform(sortableclasses.Pluggable):
...     @staticmethod
...     @abc.abstractmethod
...     def transform(input):
...         pass
...
>>> class MakeContent(Transform):
...     @staticmethod
...     def transform(input):
...         if input == ':-(':
```

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```
...             return ':-|'
...         return input
...
>>> class MakeHappy(Transform):
...     successorof = (MakeContent,)
...     @staticmethod
...     def transform(input):
...         if input == ':-|':
...             return ':-)'
...         return input
...
>>> class MakeVeryHappy(Transform):
...     successorof = (MakeHappy,)
...     @staticmethod
...     def transform(input):
...         if input == ':-)':
...             return ':-D'
...         return input
...
>>> transforms = sorted(Transform.getderived())
>>> transforms
[<class 'MakeContent'>, <class 'MakeHappy'>, <class 'MakeVeryHappy'>]
>>> input = ':-('
>>> functools.reduce(lambda k, s: s.transform(k), transforms, input)
':-D'
```

1.2 Installation

You use *sortableclasses* **at your own risk.** You have been warned.

sortableclasses requires Python 3.

If you have Python's pip, simply say:

```
pip3 install sortableclasses
```

Otherwise, download the most recent stable release (v0.9.4), unzip it and copy the directory `sortableclasses` into a directory in your Python's *sys.path*.

You can do all of the above by:

```
# Download and unpack *sortableclasses* to the current directory.
curl -f https://codeload.github.com/odkr/sortableclasses.py/tar.gz/v0.9.4 |
    tar -xz
# The command below *guesses* a directory to install *sortableclasses* to.
PYPATH=$(python3 -c 'import sys; print("\n".join(sys.path))' |
    grep -v '.zip' | grep -E "(${HOME?}|/local/)" | head -n1)
# If the command below errors, no suitable directory was found.
# Otherwise, it will show you where *sortableclasses* will be installed.
echo "${PYPATH:?'Did not find a suitable directory.'}"
# Copy the directory "sortableclasses" into that directory.
[ -d "${PYPATH:?}" ] && {
    PACKAGE=sortableclasses.py-0.9.4/sortableclasses
    cp -r "$PACKAGE" "$PYPATH" || sudo cp -r "$PACKAGE" "$PYPATH"
}
```

1.3 Documentation

You can view the reference documentation at Read the Docs or, once you installed *sortableclasses*, by:

```
pydoc3 sortableclasses
```

1.4 Contact

If there's something wrong with *sortableclasses*, please open an issue.

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1.6 Further Information

GitHub: <https://github.com/odkr/sortableclasses.py>

PyPI: <https://pypi.org/project/sortableclasses/>

Read the docs: <https://sortableclassespy.readthedocs.io/en/stable/>

CHAPTER 2

sortableclasses

Makes classes sortable by priority and precedence.

exception sortableclasses.**CyclicalOrderError**(***kwargs*)
Declared order is cyclical.

exception sortableclasses.**Error**(***kwargs*)
Base class for exceptions of this module.

class sortableclasses.**Pluggable**
Base class for simple plugin-like architectures.

To use *Pluggable*:

1. Derive an abstract base class from *Pluggable*.
2. In that abstract base class, define an interface that plugin-like classes have to implement.
3. Derrive your classes from that abstract base class.

Nota bene: Classes derived from *Pluggable* are eo ipso abstract base classes (i.e., have a metaclass derived from abc.ABCMeta).

You can now get a list of all plugin-like classes, that is, all classes derived from your abstract base class, by calling its *getderived()* method. Moreover, plugin-like classes can be sorted using sorted(). See *SortableMeta* for details.

If you have multiple types of plugins, that is, multiple plugin base classes, I recommend that you define a common plugin base class that you derive your remaining plugin base classes from.

classmethod getderived()
Get derived classes, including indirectly derived ones.

Returns All classes derived from *cls*

Return type Iterator[type]

For example:

```
>>> class PluginBaseClass(Pluggable):
...     pass
...
>>> class A(PluginBaseClass):
...     pass
...
>>> class APrime(A):
...     pass
...
>>> list(PluginBaseClass.getderived())
[<class 'sortableclasses.A'>, <class 'sortableclasses.APrime'>]
```

You can sort classes returned by *getderived()*. See *SortableMeta* for details.

For example:

```
>>> class PluginBaseClass(Pluggable):
...     pass
...
>>> class A(PluginBaseClass):
...     # Default priority is 0.
...     pass
...
>>> class B(PluginBaseClass):
...     priority = -1
...
>>> list(PluginBaseClass.getderived())
[<class 'sortableclasses.A'>, <class 'sortableclasses.B'>]
>>> sorted(PluginBaseClass.getderived())
[<class 'sortableclasses.B'>, <class 'sortableclasses.A'>]
```

class sortableclasses.**SortableABCMeta**
A metaclass for abstract base classes that should be sortable.

class sortableclasses.**SortableMeta**
Classes of this type can be sorted().

Caveat: On a 1,4 GHz Intel Core i5 with a load average of 1.7, sorting a list of plugins into an order that, one, is defined using *priority* for one half of the plugins and *predecessorof* for the other and where, two, swapping any two plugins will undo that order will take, approximately:

Plugin count	Initial order	
•	non-random	pseudo-random
256	0.01s	0.04s
1024	0.09s	0.93s
4096	1.68s	18.41s

That said, the order sketched out above is rather demanding:

1. It's, in part, defined via a *long* chain of precedence (up to 2048 elements).
2. It requires every plugin to be at a definite position.

Also, in the 'real world', sequences of plugins shouldn't be in pseudo-random order.

On the same hardware, sorting a list of plugins into an order that is only defined using *SortableMeta.priority* will take approximately:

Plugin count	Time
65,536	0.22s
638,899	4.50s

(The above tests were done with a non-random initial order.)

That being so, you should be fine as long as:

1. You sort no more than about 8,192 plugins.
2. No chain of succession or precedence is longer than about 128 plugins.
3. Your order doesn't require every plugin to be at a definite position.

__lt__(*other: sortableclasses.SortableMeta*) → bool
Check if *cls* class precedes *other*.

Parameters **other** (SortableMeta) – Class to compare *cls* to.

Returns Whether *cls* precedes *other*.

Return type bool

Raises ***CyclicalOrderError*** – If, according to the order defined bythe *successorof* and *predecessorof* attributes,two plugin-like classes would have to precede *and* succeed each other.

Whether a plugin-like class precedes another one is governed by their sorting attributes:

- *successorof* – A sequence of plugin-like classes that should precede *cls* (defaults to an empty tuple).
- *predecessorof* – A sequence of plugin-like classes that should succeed *cls* (defaults to an empty tuple).
- *priority* – A number that expresses the priority of *cls*, where lower numbers express a higher priorit (defaults to 0).

successorof and *predecessorof* take precedence over *priority*.

For example:

```
>>> class sortableclass(Pluggable):
...     pass
...
>>> class A(sortableclass):
...     # Default priority is 0.
...     pass
...
>>> class B(sortableclass):
...     priority = -1
...
>>> class C(sortableclass):
...     predecessorof = (B,)
...     successorof = (A,)
...
>>> B < A
True
>>> B < C
True
>>> A < B
```

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```
False
>>> A < C
True
>>> C < B
True
>>> C < A
False
```

inpredecessorsof (*other: sortableclasses.SortableMeta*) → bool

Check if *cls* is in the chain of precedence of *other*.

Parameters **other** (SortableMeta) – Class to compare *cls* to.

Returns Whether *other* is a member of the *predecessorof* attribute of *cls*, the classes *cls* is a predecessor of,the classes these classes are predecessors of, and so on.

Return type bool

A class is in the chain of precedence of another class if it, or one of its successors, declares itself to be a *predecessorof* that class.

For example:

```
>>> class sortableclass(Pluggable):
...     pass
...
>>> class A(sortableclass):
...     pass
...
>>> class B(sortableclass):
...     predecessorof = (A,)
...
>>> class C(sortableclass):
...     predecessorof = (B,)
...
>>> C.inpredecessorsof(A)
True
```

However, different to *precedes()*:

```
>>> class B(sortableclass):
...     pass
...
>>> class A(sortableclass):
...     successorof = (B,)
...
>>> B.inpredecessorsof(A)
False
```

insuccessorsof (*other: sortableclasses.SortableMeta*) → bool

Check if *cls* is in the chain of succession of *other*.

Parameters **other** (SortableMeta) – Class to compare *cls* to.

Returns Whether *other* is a member of the *successorof* attribute of *cls*, the classes *cls* is a successor of,the classes these classes are successors of, and so on.

Return type bool

A class is in the chain of succession of another class if it, or one of its predecessors, declares itself to be a *successorof* that class.

For example:

```
>>> class sortableclass(Pluggable):
...     pass
...
>>> class A(sortableclass):
...     pass
...
>>> class B(sortableclass):
...     successorof = (A,)
...
>>> class C(sortableclass):
...     successorof = (B,)
...
>>> C.insuccessorsof(A)
True
```

However, different to *succeeds()*:

```
>>> class B(sortableclass):
...     pass
...
>>> class A(sortableclass):
...     predecessorof = (B,)
...
>>> B.insuccessorsof(A)
False
```

precedes (*other: sortableclasses.SortableMeta*) → bool

Check if *cls* precedes *other*.

Parameters **other** (SortableMeta) – Class to compare *cls* to.

Returns Whether *cls* precedes *other*.

Return type bool

Doesn't take priority into account.

Caveat: Doesn't check whether the declared order is consistent. That is, returns *True* even if *other* also precedes *cls*.

For example:

```
>>> class sortableclass(Pluggable):
...     pass
...
>>> class A(sortableclass):
...     pass
...
>>> class B(sortableclass):
...     predecessorof = (A,)
...
>>> B.precedes(A)
True
```

Also, different to *inpredecessorsof()*:

```
>>> class B(sortableclass):
...     pass
...
>>> class A(sortableclass):
...     successorof = (B,)
...
>>> B.precedes(A)
True
```

predecessorof = ()
Sequence of classes used by *inpredecessorsof()*.

priority = 0
Number used by *__lt__()*.

succeeds(*other: sortableclasses.SortableMeta*) → bool
Check if *cls* succeeds *other*.

Parameters **other** (SortableMeta) – Class to compare *cls* to.

Returns Whether *cls* succeeds *other*.

Return type bool

Doesn't take priority into account.

Caveat: Doesn't check whether the declared order is consistent. That is, will return *True* even if *other* also succeeds *cls*.

For example:

```
>>> class sortableclass(Pluggable):
...     pass
...
>>> class B(sortableclass):
...     pass
...
>>> class A(sortableclass):
...     successorof = (B,)
...
>>> A.succeeds(B)
True
```

Also, different to *insuccessorsof()*:

```
>>> class A(sortableclass):
...     pass
...
>>> class B(sortableclass):
...     predecessorof = (A,)
...
>>> A.succeeds(B)
True
```

successorof = ()
Sequence of classes used by *insuccessorsof()*.

CHAPTER 3

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